6

ROYAL COLLEGE OF SURGEONS ENGLAND LIBRARY
30 JAN 91

PROPOSALS FOR
Antiseptic Drainage
AND
UTILIZATION OF THE WHOLE OF THE PRODUCTS OF EXCRETE,

BY

T. M. LOWNDS, M.D.,
Retired Surgeon-Major H.M.I. Medical Service.

With compliments

ROYAL COLLEGE OF SURGEONS OF
30 JAN 91

THE present system of sewage, by water carriage of all débris produced in our houses to cesspools or to water courses, or to sewage farms, is bad, for it diffuses all the foul matters through an immense volume of water which renders the sewage of excrete prone to decompose, and by decomposition to give off gases of the most deleterious character, and by mixing with water to render it sewage in characteristics.

I.—The objection to the allowing of sewage to flow into a cesspool with pervious walls is that it saturates the ground all around, and the quantity of ground defiled is year by year greater, so that at a period not distant, not only will the surface or shallow wells be infiltrated but also the deep springs contaminated. The cesspool system also locks up in the depths of the earth what should be applied to the surface to reproduce the fruits of the ground.

II.—The objections to river carriage of sewage are recognised in what I have stated as to cesspools, only that the sewage products are diffused over a vastly increased area, and cause our at one time fair streams to become little better than sewers, with their beds a mass of noisome filth.

III.—The objection to sewage farms, as at present conducted, is that they are expected to purify 50 or 100 times as much sewage as the products grown can take up, and they are taxed with as much work when vegetation is at a standstill as when the plants are assimilating food. As an extreme example of the amount of sewage thrown on land, Swaffham may be instanced, where three acres of land are expected at all seasons of the year to purify the sewage of a population of 2500!! This must be only filtration not purification, and in time the formation of a huge sewer sponge. [*v. Return of Sewage Purification, Rochdale*, 1874.]

The plan, which has been at various times proposed and which I would amplify, is to separate all ordinary foul water from human excrete by the use of a dry charcoal closet in which peat charcoal is used for absorbing the gases from the solid excrete, and the fluid excrete is received and preserved separately. (This closet I shall hereafter more particularly describe, and it is the substitute in houses for a water closet.)

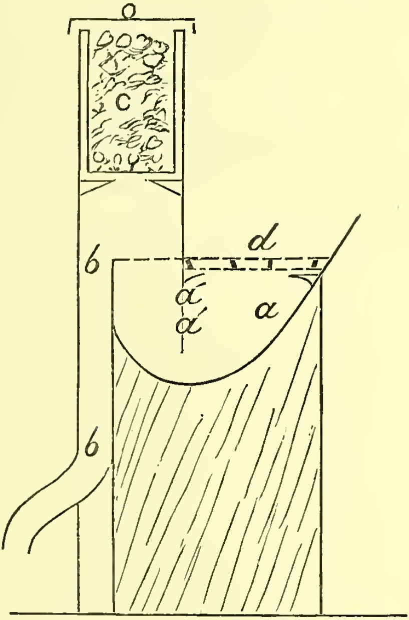
If human excrete is separated from the water system of carriage, much has been done to purify the sewage water from its worst defilements, but to make it still less like sewage I propose that the kitchen sink should act as a settling tank and have a pipe carrying the foul water to the bottom of the tank. This tank is of capacity sufficient to contain the average daily quantity from the kitchen and scullery sink, and is called the settling tank.

The mode of operation is somewhat as follows:—The fluid (sink water slops from the kitchen, &c.) passes down the straight pipe from the sink to the bottom of the tank where the parts heavier than water gradually settle, and the lighter as fat, &c., at once rise up through the liquid and remain at the top, forming immediately a pellicle, and in the course of a few days a stratum of fatty matter. The water takes nearly 24 hours to rise up from the bottom of the tank to the overflow to the drainage system, during all of which time settlement is going on. The communication to the overflow to the drain is 6 inches below the surface of the water in the tank, so that the floating fat is never disturbed.

The addition of a small quantity of Sulphate of Alumina to the sink water reduces the quantity of sediment in the effluent water left after subsidence by at least one-half to three-fifths. I have had a tank of this kind in use for the last 7½ months. It has purified the water from the kitchen sink to the extent of about four-fifths as nearly as could be judged. After 7 months it was cleaned out by removing the man hole and taking off the fat with a skimmer. The layer of fat was nearly 6 inches thick. There was a close disagreeable smell from it, but only when it was being removed. The settlement of mud at the bottom was removed by a dredge at the end of a five feet pole. The whole process of cleansing took about three-quarters of an hour. During the very hot season that has been experienced the freedom from the slightest trace of smell is sufficient to demonstrate that, on that score, it is quite successful.

Before describing the peat charcoal closet, I must describe the antiseptic urinal (patented) a modified form of which is fixed under the front part of the seat.

I have determined in the most positive manner that urine on which a layer of oil contained about 10 per cent. of an antiseptic such as terebene oil, crude creosote, carbolic acid, &c. has been placed, undergoes no change whatever. I have some urine so preserved for the last 18 or 19 months in a glass vessel exposed to sun, light, air, and heat in a conservatory, which is as free from decomposition and smell as it was at first, and the mucus is just as it appeared when it settled down. I give a rough sketch of the section of this antiseptic urinal.



A à à is an earthenware or properly glazed metal urinal fixed in brickwork in the ordinary way, the curtain à à dipping down to within two inches of the bottom, this allows of free communication between the front and back part of the urinal and the permanent level of the excrete fluid in the plan always remains the same on each side of the curtain à à. The overflow pipe b b carries the same amount of added fluid off to the drain or a special receptacle for it. C is a perforated box filled with pieces of wood charcoal which deodorises any gas which may come up the pipe b. The front of the urinal d is provided with a moveable perforated slab of earthenware resting on shoulders in the pan. This slab of earthenware in practice is enveloped in a layer of the preservative oil, (*i.e.* oil to which 10 per cent. or so of an antiseptic oil has been added) on the surface of the urine which fills the urinal up to the level b and d, and always remain at the same level except when it is used when the fluid excrete dropping on the surface of the oil falls or sinks through it and deranges the level of the liquid at b and d, then an equivalent quantity to what has been added flows over into the pipe b b. The use of the perforated slab is to prevent any appreciable current being established so as to carry down the preservative oil with it, and also to prevent any extraneous matter thrown on the fluid sinking down so as to block up the lower part of the pan. The lowest layer of charcoal in the box c may be saturated with an antiseptic oil. It is absolutely necessary that communication with the air be established to prevent syphon action being established.

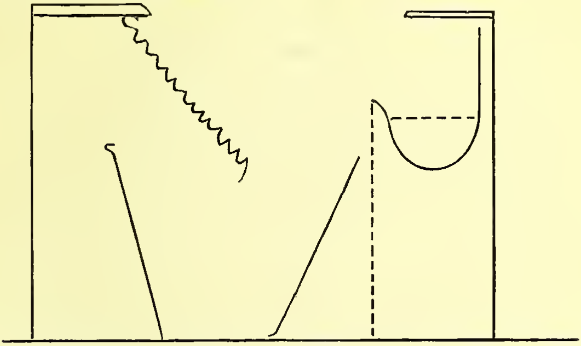
There is a small opening about 2 inches diameter in the perforated slab which is fitted up with a moveable piece of perforated earthenware, this opening is for allowing the curved spout of a can used for collecting fluid excrete to be inserted and thus its contents to be introduced under the preservative oil, doing away with any disturbance of the sealing of the urine.

This apparatus may be used for any fluid which is liable to decompose and occasion nuisance.

The overflow pipe or pipes go into a tank or tanks of such capacity as to contain the quantity likely to be collected in five or six months, the surface of which is covered in the same way by the preservative oil.

The plan of this sanitary arrangement is to keep all human fluid excrete quite separate from ordinary fouled water.

For the closet I use a modification of the antiseptic urinal described above. The modification being that the overflow pipe is at one end of the urinal instead of at the back, and a protected elongated basin or glass is fixed at a convenient height under the front seat of the closet to receive the urine. The solid excrete is received on an angulated piece of galvanized iron, on which, after each use of the closet trickles a small quantity from 5 to 6 ounces of peat charcoal. This fills up the angles of the galvanized iron and forms a plain surface of peat charcoal, in which as the fæces roll down they are enveloped and fall into the receiving vessel. The hopper is not shown in the sketch.



The quantity of solid débris plus the peat charcoal will not probably be more than 8 ounces per diem, so that the solid débris will not exceed about 22 or 25 pounds for removal each week from a household of six persons, it cannot be a very difficult matter for a cart to collect it every 7 days. Its ultimate disposal for manure shall be hereafter considered with that of the fluid excrete.

Before stating how the collected fluids and solids are to be dealt with, I recapitulate how the materials of present water carried sewage are proposed to be dealt with before leaving the house where they are produced.

1st.—Fouled water (apart form human excrete) is settled down from 24 to 30 hours, which allows the settlement of the portions heavier than water to accumulate at the bottom of the tank, and keeps the fatty matter at the top, and the fluid then goes to the drain. This settlement is assisted by chemical means as rough sulphate of alumina.

2nd —Solid fæces is kept in peat charcoal which destroys any effluvia and absorbs all the ammonia. This should be removed weekly.

3rd.—Fluid excrete is kept in an under-ground water-tight tank with a layer of preservative oil, and should be removed once in 6 months, still always under the protection of the oil as it is kept in the urinal.

The adoption of such a plan, as I have sketched, presents in the country or small towns no difficulties. The solid enveloped in peat charcoal may be kept in a proper dry receptacle there to accumulate until it is required for use or removal by the farmers of the neighbourhood, who will soon, if they do not now know its value as a manure. It has been stated on good authority that the manurial value of peat charcoal alone is one pound per ton. How much more will it be with the solid excrete added.

The fluid stored as described in a water-tight tank under the preservative oil should be removed only at those seasons when its addition to the soil renders it easily assimilated by the growing plants. To remove the same, if it is to be used near the spot, the suction pipe of a 2 inch force pump is introduced below the preservative oil to the bottom of the tank, and the discharge pipe into a tank on wheels in which has been placed the proper quantity of water to dilute the urine so that it may at once be applied to grass or other crops. The dilution should be at least four parts of water to one of the urine. Thus it is at once prevented giving out any smell and prepared for immediate distribution.

If it is to be removed to a distance the water cart should be covered and protected by a charcoal box in the same way as is the escape pipe from the urinal to the receptacle, and the discharge pipe of the pumps carried down to the bottom of the water cart, so that after the first minute or two the discharge takes place in the fluid itself.

In the case of a larger town say of 20,000 inhabitants special organization must be adopted for removing the fluid excrete. There must be a pumping station with a reservoir to hold at least 2 days' supply of the fluid excrete from the whole of the inhabitants, and from this reservoir a pipe leads to a manufactory in the country where the urine is evaporated in vacuo so that there can be no loss and no effluvia. I mean to suggest that the low temperature of evaporating should, as in the case of sugar boiling, be adopted. It is brought from the water-tight receptacle in water carts, protected in the same way as I have already described for the country, and emptied into the reservoir tank by a small steam engine, the discharge pipe of the pump being always below the preservative fluid on the surface of the fluid in tank.

In such a city as London a considerable number of secondary pumping stations would be required to pump to the main station, which last should pump to a factory on the system which I have indicated, on the banks of the Thames on the Essex side for the North of London, and a similar arrangement for the South side in Kent.

The difficulties of this plan commence with domestics, but clear instructions and some supervision for a time, and the fact that the plan would be easier than the old system would doubtless succeed in a short time in causing it to be carried out.

I do not for one moment contend that I have hinted at the best plan for removing either solid or fluid excrete, but I claim to have indicated how the problem may be solved, with the ultimate result of purifying our rivers and wells, and saving a vast proportion of the ammoniacal forming salts and phosphates of the food which have been abstracted from the ground in raising that supply of food. Only the bones of man and the ammoniacal elements buried with him must be deducted from the total amount of phosphates and ammonia which he has consumed in his life-time.

Now as to the cost. This of course can be only approximate or perhaps hypothetical. It may be stated with great certainty that the value of human fluid excrete is at least 6s. 8d. for each individual per annum on an average. This is only two-thirds of the amount given by Captain Lienur. At the calculation of 2½-lbs. per diem, per person, no less than 1000 tons of fluid human excrete per diem are carried into the stream from every million of inhabitants living on river banks who use water carriage of sewage. From London alone 4000 tons are daily carried into the Thames, and these 4000 tons have at least the manurial value of 15s. per ton, or £3000 per diem thrown as waste into the river to be got rid of, and in getting rid of it only to be a source of loss and pollution.

Now the cost of manufacturing these 4000 tons may be roughly stated as under :—

	£	s.	d.
2½ tons of coal for each 16 tons of urine (a large allowance) at 15/- per ton	1	17	6
Labour at 30/-	1	10	0
Wear and tear of manufactory, say 30/-	1	10	0
	£4	17	6
Say ⅓ more for miscalculation	1	12	6
Or per ton	£6	10	0

for a product worth as much as Peruvian Guano.

It may be asked parenthetically would the agricultural interest of Great Britain be unable to compete with continental nations if the débris of food equal to upwards of 600,000 tons of the best Peruvian Guano had been annually available to them at cost price?

The human fluid excrete when desiccated contains nitrogen for forming a larger proportion of ammonia than sulphate of ammonia contains of that substance ready formed, besides some 10 or 12 per cent. of salts containing phosphate of lime and magnesia, sulphate of potash, and other salts very valuable for the growing crops, being just what has been removed from the soil plus the larger amount of earthy salts contained in the solid excrement. This should be brought to the manufactory dried and pulverized before being mixed with the desiccated product of the fluid excrete.

The cost of materials to the householder would be very slight about 1s. 6d. per inmate for the peat charcoal per annum, and three or four shillings would probably cover the cost of antiseptic oil. Against this is to be set the saving of water as used for the closet under present arrangements.

The advantages claimed are the purification of rivers, the abolition of cesspools, and the gradual purification of our soil and subsoil, and as I have shown the value of the product would be some 8 or 10 millions sterling for Great Britain annually, the whole cost of which would be expended in wages for the different workmen employed The subject is worthy of thought as to how the object can be carried out in practice, but it all depends upon the fact that urine can be so kept for months as to be without change, and decomposition.

The suggestions I have made may not be the best, but it seems to me that they are feasible, and I have thus brought before the public these plans that they may perchance receive from practical engineers and architects a solution which will fix them for use and benefit of the nation.

EGHAM HILL, MARCH 1ST, 1886.

PRINTED BY WILLIAM F. LARKIN, HIGH STREET, EGHAM.